



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/593,960

09/22/2006

Yasushi Araki

Q97019

4025

65565 7590 04/28/2010
SUGHRUE-265550
2100 PENNSYLVANIA AVE. NW
WASHINGTON, DC 20037-3213

EXAMINER

GUPTA, RAJ R

ART UNIT

PAPER NUMBER

2814

NOTIFICATION DATE

DELIVERY MODE

04/28/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

SUGHRUE265550@SUGHRUE.COM
USPTO@SUGHRUE.COM
PPROCESSING@SUGHRUE.COM

Office Action Summary	Application No. 10/593,960	Applicant(s) ARAKI, YASUSHI	
	Examiner RAJ GUPTA	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4,10,12 and 14-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4,10,12 and 14-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Application/Control Number: 10/593,960

Page 2

Art Unit: 2814

Attorney's Docket Number: Q97019

Filing Date: 3/18/2005

371 Date: 9/22/2006

Claimed Domestic Priority: NONE

Claimed Foreign Priority: 3/22/2004 (JP 2004-082002)

Applicant: Araki

Examiner: Raj R. Gupta

DETAILED ACTION

This Office Action responds to the amendment and RCE filed on 3/26/2010.

Acknowledgement

1. The amendment filed on 3/26/2010, responding to the Advisory Action mailed on 2/17/2010, has been entered. The present Office Action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office Action are **claims 1, 4, 10, 12, and 14-20**.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/26/2010 has been entered.

Claim Objections

3. **Claim 10** is objected to because of the following informalities: claim 10 recites, "said at least one electron transporting organic material is a compound represented by formula (IX) ..." However, claim 1, from which claim 10 depends recites, "said at least one electron transporting organic material is a compound represented by formula (VIII) ..." It should be clear upon examination of these formulae that formula (IX) is not a narrower version of formula (VIII), but rather that formula (VIII) contains features (linking groups L1-L3) that are not present in formula (IX), and thus these claims are incompatible. For the purposes of examination of claim 10, the limitations of claim 1 referring to formula (VIII) will be disregarded. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claims 1, 4, 10, 12, and 14-20** rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim

Art Unit: 2814

indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949).

7. In the present instance, **claim 1** recites the broad recitation, “said at least one electron transporting organic material is a compound represented by formula (I) ...”, and the claim also recites, “said at least one electron transporting organic material is a compound represented by formula (VIII) ...” which is the narrower statement of the range/limitation. **Claims 4, 10, 12, and 14-20** inherit the deficiencies of claim 1.

8. For the purposes of rejections with regard to the prior art, the limitations of claim 1 with regard to formula (VIII) will be disregarded.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Initially, and with respect to **claims 15 and 16**, note that a “product-by-process” claim is directed to the product *per se*, no matter how actually made. See In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) and the related case law cited therein with make it clear that it is the final product *per se* which must be determined in a “product-by-process” claim, and the patentability of the process, and that, as here, an old or obvious product produced by a new method is

Art Unit: 2814

patentable as a product, whether claimed in “product-by-process” claims or not. As stated in Thorpe,

even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935).

Note that the Applicant has the burden of proof in such cases as the above case law makes clear.

11. **Claims 1, 4, 10, 12, and 14-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Petritsch et al (US 6340789)** in view of **Stossel et al (US 7223484)** as evidenced by **Asfandiarov et al (Investigation of Electron Structure of 2,1,3-Benzothiadiazole Derivatives by Means of Negative Ion Mass Spectrometry, Photoelectron Spectroscopy and Absorption Spectroscopy; Rapid Commun. Mass Spectrom. 12, 595–602, 1998)**, **Nakaya et al (US 5792557)**, and **Kimura (US 2003/0072965)**.

12. With regard to **claim 1**, Petritsch teaches, in Fig 5, a photodetector (Fig 5 item 20) comprising: at least one electron transporting organic material (Fig 5 item 14; “MCP” col 6 ln 31); and at least one hole transporting material (Fig 5 item 6).

13. Petritsch does not explicitly teach that said at least one electron transporting organic material has an ionization potential of 5.8 eV or more, wherein said ionization potential of said at least one electron transporting organic material is larger than an energy necessary for the highest-level electron of said at least one hole transporting organic material to be taken out to a vacuum infinite far point, wherein said ionization potential of said at least one electron transporting organic material is larger than an ionization potential of said at least one hole transporting

Art Unit: 2814

organic material by 0.6 eV or more, and wherein said at least one electron transporting organic material is a compound represented by formula (I):

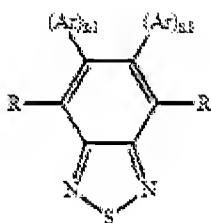
Formula (I)



wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different.

14. Stossel teaches the use of 2,1,3-Benzothiadiazole derivatives as Formula (III):

Formula (III)



as, "An organic photodetector ... transport material ..." (col 30 ln 11-13), in since, " The 2,1,3-benzothiadiazole-containing compounds of the invention lead, when appropriate devices are used, to excellent operating lives ..." (col 2 ln 57-59).

15. However Stossel does not explicitly disclose the fact that the ionization potential of 2,1,3-Benzothiadiazole derivatives is greater than 5.8 eV.

16. Asfandiarov provides evidence that the ionization energies of 2,1,3-benzothiadiazole derivatives are in excess of 5.8 eV, as they range from 7.77 - 8.44 eV (pg 597, Table 2).

17. Thus Stossel does teach: the ionization potential of said at least one electron transporting organic material is more than 5.8 eV.

Art Unit: 2814

18. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the electron transporting organic material of Stossel as evidenced by Asfandiarov in concert with the photodetector of Petritsch to lead to appropriate devices with excellent operating lives.

19. Petritsch/Stossel do not explicitly teach that said ionization potential of said at least one electron transporting organic material is larger than an energy necessary for the highest-level electron of said at least one hole transporting organic material to be taken out to a vacuum infinite far point, wherein said ionization potential of said at least one electron transporting organic material is larger than an ionization potential of said at least one hole transporting organic material by 0.6 eV or more, and wherein said at least one electron transporting organic material is a compound represented by formula (I):

Formula (I)



wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different.

20. Nakaya teaches that said ionization potential of said at least one electron transporting organic material is larger than an energy necessary for the highest-level electron of said at least one hole transporting material to be taken out to a vacuum infinite far point or an ionization potential of said at least one electron transporting organic material is more than an ionization potential of said at least one hole transporting organic material, by stating, "... the difference in ionization potential I_p between the layer having a hole injecting and transporting function and

Art Unit: 2814

the layer having a[n] ... electron injecting and transporting function is at least 0.25 eV,” (col 10 ln 47-52), in order to have a, “photo-electron function,” (col 4 ln 41). Please note that it is well known in the art that the energy necessary for the highest-level electron of a given material to be taken out to a vacuum infinite far point is the very definition of an ionization potential.

21. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the ionization potentials of Nakaya along with the photodetector of Petritsch/Stossel to have a device with a photo-electron function.

22. Petritsch/Stossel/Nakaya discloses most aspects of the instant invention (see paragraphs 5-14 above). However, Petritsch/Stossel/Nakaya fails to show that said ionization potential of said at least one electron transporting organic material is larger than an ionization potential of said at least one hole transporting organic material by 0.6 eV or more. Nonetheless, the skilled artisan would know too that the difference in ionization potential between the hole and electron transporting materials would impact charge separation effectiveness.

23. The specific claimed difference in ionization potential, absent any criticality, is only considered to be the “optimum” difference in ionization potential disclosed by Petritsch/Stossel/Nakaya that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired charge separation, manufacturing costs, etc., (see Goesch, 205 USPQ 215 (CCPA (19080))), and since neither non-obvious nor unexpected results, i.e. results which are different in kind and not in degree from the results of the prior art, will be obtained as long as the difference in ionization potentials is used, as already suggested by Petritsch/Stossel/Nakaya.

Art Unit: 2814

24. Since the applicant has not established the criticality (see next paragraph) of the difference in ionization potentials stated and since these differences in ionization potentials are in common use in similar devices in the art, it would have been obvious to one of ordinary skill in the art at the time of the invention to use these values in the device of Petritsch/Stossel/Nakaya.

CRITICALITY

25. Please note that the specification contains no disclosure of either the critical nature of the claimed difference in ionization potentials or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

26. Petritsch/Stossel/Nakaya do not explicitly teach that said at least one electron transporting organic material is a compound represented by formula (I):

Formula (I)



wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different.

27. Kimura teaches that said at least one electron transporting organic material is a compound represented by formula (I):

Formula (I)

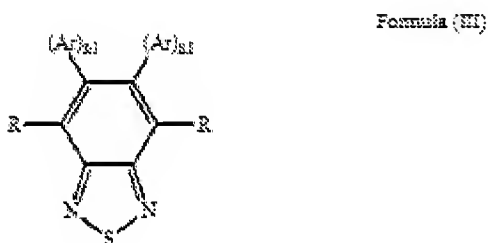


Art Unit: 2814

28. wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different ([0015]) to, “provide a ... device excellent in ... durability ...” ([0007]).

29. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the electron transporting organic material of Kimura along with the photodetector of Petritsch/Stossel/Nakaya to provide a device excellent in durability.

30. With regard to **claim 4**, Stossel teaches the use of 2,1,3-Benzothiadiazole derivatives as Formula (III):



as, “An organic photodetector ... transport material ...” (col 30 ln 11-13).

31. However Stossel does not explicitly disclose the fact that the ionization potential of 2,1,3-Benzothiadiazole derivatives is 6.0 eV or more.

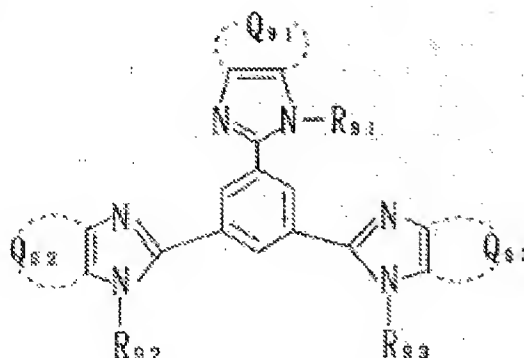
32. Asfandiarov provides evidence that the ionization energies of 2,1,3-benzothiadiazole derivatives are in excess of 6.0 eV, as they range from 7.77 - 8.44 eV (pg 597, Table 2).

33. Thus Stossel does teach that the ionization potential of said at least one electron transporting organic material is 6.0 eV or more.

With regard to **claim 10**, Kimura teaches that said at least one electron transporting organic material is a compound represented by formula (IX):

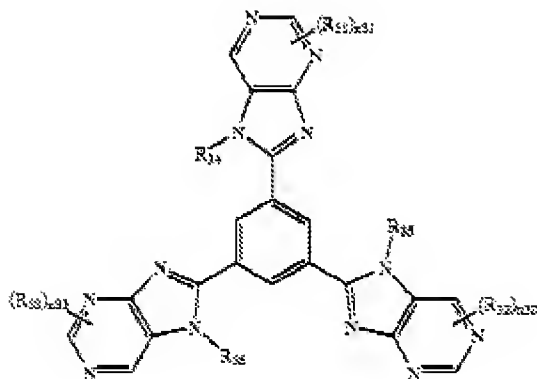
Art Unit: 2814

Formula (IX)



wherein Q_{91} , Q_{92} and Q_{93} each independently represents an atomic group necessary for forming a 6-membered nitrogen-containing aromatic hetero ring; and R_{91} , R_{92} and R_{93} each independently represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a hetero ring group, by teaching in Formula (III):

Formula (III)



where, " R_{31} , R_{32} and R_{33} represent a substituent, respectively; R_{34} , R_{35} and R_{36} represent a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a heterocyclic group, respectively; and n_{31} , n_{32} and n_{33} represent an integer of 0 to 2, respectively," ([0015]).

34. With regard to **claim 12**, Petritsch teaches in Fig 5: at least one transparent electrode (Fig 5 item 4, "are transparent" col 5 ln 32); and at least one electrode (Fig 5 item 12), wherein said at

Art Unit: 2814

least one electron transporting organic material (Fig 5 item 14) is interposed between said at least one transparent electrode and said at least one electrode (it is clear from Fig 5 that item 14 is disposed between items 4 and 12).

35. With regard to **claim 14**, Petritsch teaches in Fig 5: at least one transparent electrode (Fig 5 item 4, “are transparent” col 5 ln 32); and at least one electrode (Fig 5 item 12), wherein said at least one electron transporting organic material (Fig 5 item 14) and said at least one hole transporting organic material (Fig 5 item 6) are interposed between said at least one transparent electrode and said at least one electrode (it is clear from Fig 5 that items 14 and 6 are disposed between items 4 and 12).

36. With regard to **claim 15**, Petritsch/Stossel/Nakaya/Kimura teach most of the limitations of this claim as discussed above in paragraphs 12-29. However, Petritsch/Stossel/Nakaya/Kimura do not explicitly teach that said at least one electron transporting organic material is deposited in vacuum. Nonetheless, this is considered an intermediate process step that does not affect the structure of the final device. As to the grounds of rejection under section 103, see MPEP § 2113 which discusses the handling of “product-by-process” claims.

37. With regard to **claim 16**, Petritsch/Stossel/Nakaya/Kimura teach most of the limitations of this claim as discussed above in paragraphs 12-29. However, Petritsch/Stossel/Nakaya/Kimura do not explicitly teach that at least one of said at least one electron transporting organic material and said at least one hole transporting organic material is deposited in vacuum. Nonetheless, this is considered an intermediate process step that does not

Art Unit: 2814

affect the structure of the final device. As to the grounds of rejection under section 103, see MPEP § 2113 which discusses the handling of “product-by-process” claims.

38. With regard to **claim 17**, Petritsch teaches: An imaging device comprising a photodetector. by stating, “there is provided a method of forming a ... photoconductive device ...” (col 2 ln 24-26).

39. **Claims 18-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Petritsch et al (US 6340789)** in view of **Stossel et al (US 7223484)** as evidenced by **Asfandiarov et al (Investigation of Electron Structure of 2,1,3-Benzothiadiazole Derivatives by Means of Negative Ion Mass Spectrometry, Photoelectron Spectroscopy and Absorption Spectroscopy; Rapid Commun. Mass Spectrom. 12, 595–602, 1998)**, **Nakaya et al (US 5792557)**, and **Kimura (US 2003/0072965)** as applied to claim 17 above, and further in view of **Iwasaki (US 2003/0209651)**.

40. Petritsch/Stossel/Nakaya/Kimura teach most of the limitations of these claims as discussed above in paragraphs 12-29 and 38.

41. Petritsch also teaches in Fig 5: a substrate (Fig 5 item 10); and a first layer comprising a first photodetector (Fig 5 items 6, 28, and 14).

42. Petritsch/Stossel/Nakaya/Kimura do not explicitly teach: a second layer comprising a second photodetector; a third layer comprising a third photodetector; the first photodetector comprises a blue light photodetector; the second photodetector comprises a green light photodetector; and the third photodetector comprises a red light photodetector.

43. Iwasaki teaches a second layer comprising a second photodetector (Fig 1 item 101); a third layer comprising a third photodetector (Fig1 item 103); the first photodetector (Fig 1 item

Art Unit: 2814

102) comprises a blue light photodetector (clearly visible in Fig 1 as the portion of the light labeled “B” is absorbed by this layer); the second photodetector comprises a green light photodetector (clearly visible in Fig 1 as the portion of the light labeled “G” is absorbed by this layer); and the third photodetector comprises a red light photodetector (clearly visible in Fig 1 as the portion of the light labeled “R” is absorbed by that layer), in order to not have to use a color filter system ([0005]-[0007]).

44. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the multiple photodetectors of Iwasaki along with the photodetector of Petritsch/Stossel/Nakaya/Kimura to not have to use a color filter system.

Response to Arguments

45. The applicants argue:

The disclosure of Kimura relates to an organic electroluminescence device. See Abstract of Kimura. The presently claimed invention relates to a photoelectric conversion element. Therefore, Kimura does not teach or suggest using the electron transporting compound represented by formula (II) of Kimura for a photoelectric conversion element. It is non-obvious that an electron transporting compound used in organic electroluminescence devices could be simply used in photoelectric conversion elements with a reasonable expectation of success.

46. The examiner responds:

47. While the teachings of Kimura may be primarily directed toward an organic electroluminescent device, the disclosure makes clear that the various organic compounds taught by Kimura have a wide applicability for a variety of electronic devices (see [0045] and [0050]). Furthermore, as light emitting diodes and photodiodes are so similar in structure and requirements of components, it would have been obvious to one of ordinary skill in the art to apply the teachings of Kimura to a photodiode with a reasonable expectation of success with an

Art Unit: 2814

ordinary amount of experimentation (the exact nature of such ordinary experimentation discussed by the applicant in the Remarks filed 3/26/2010, pages 8-9).

Conclusion

48. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAJ GUPTA whose telephone number is (571)270-5707. The examiner can normally be reached on Monday-Thursday 9am-6pm.

49. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571)272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

50. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RAJ GUPTA
Examiner, Art Unit 2814
April 14, 2010

/Marcos D. Pizarro/
Primary Examiner, Art Unit 2814